

Title: Flying Through Fractions!

Brief Overview:

In this unit students will be able to take a whole and divide it into fractional parts and equivalent fractions. Students will prepare for a kite contest. They will work with fractions of shapes and fractions of sets to recognize equivalent fractions. In the culminating activity they will combine unlike fractional parts to complete a whole and explain their thinking.

NCTM 2000 Principles for School Mathematics:

- **Equity:** *Excellence in mathematics education requires equity - high expectations and strong support for all students.*
- **Curriculum:** *A curriculum is more than a collection of activities: it must be coherent, focused on important mathematics, and well articulated across the grades.*
- **Teaching:** *Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well.*
- **Learning:** *Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge.*
- **Assessment:** *Assessment should support the learning of important mathematics and furnish useful information to both teachers and students.*
- **Technology:** *Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.*

Links to NCTM 2000 Standards:

- **Content Standards**

- **Number and Operations**

- *Develop an understanding of fractions as parts of unit wholes, and as parts of a collection.*
 - *Use models, benchmarks, and equivalent forms to judge the size of fractions.*
 - *Recognize and generate equivalent forms of commonly used fractions.*

- **Geometry**

- *Make and test conjectures about geometric properties and relationships and develop logical arguments to justify conclusions.*

- **Measurement**

- *Select and use benchmarks to estimate measurements.*

- **Process Standards**

- **Problem Solving**

- *Apply and adapt a variety of appropriate strategies to solve problems.*
 - *Monitor and reflect on the process of mathematical problem solving.*

- **Reasoning and Proof**

- *Select and use various types of reasoning and methods of proof.*

- **Communication**

- *Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.*

- **Connections**

- *Recognize and use connections among mathematical ideas.*
 - *Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.*

- **Representation**

- *Create and use representations to organize, record, and communicate mathematical ideas.*

Grade/Level:

Grades 3-4

Duration/Length:

This unit will require 4-5 days.

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Recognizing fractions as part of a whole
- Recognizing common fractions (i.e., $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$)
- Expressing thoughts orally and written

Student Outcomes:

Students will:

- read, write, and represent fractions using symbols and words.
- represent fractions in equivalent forms.
- connect representations of fractional values using concrete materials, drawings or pictures, and mathematical symbols.

- show whole/part relationships of common fractions.
- use fraction circles to construct representations of equivalent fractions of a whole.
- use cubes to construct representations of fractional parts of sets.
- create a kite using specific fractional parts.
- explain their reasoning.
- work in cooperative groups.

Materials/Resources/Printed Materials:

- Fraction circles (1 set per student)
- Colored cubes
- Overhead fraction circles
- Crayons
- Index cards
- Chart paper
- Book Let's Fly A Kite by Stuart J. Murphy
- Student Resource Sheets #1-9
- Teacher Resource Sheets #1-9
- Transparencies of Student Resource Sheets #1, 2, 3, 5, 7.
- Teacher Resource Cards #1-4
- Performance Assessment Sheets #1-3
- Scoring Rubric for Performance Assessment

Development/Procedures:

Day One:

- In groups of 3-4, students brainstorm ways to show $\frac{1}{2}$.
- Have students put ideas on chart paper and discuss.
- Read Let's Fly A Kite by Stuart J. Murphy.
- Give each student 1 set of fraction circles.
- Using fraction circles and Student Resource Sheet 1 (1 per student), the class will work together to discover fractions equivalent to $\frac{1}{2}$. Draw a picture of each equivalent fraction that equals one half. Write the name of the fraction and write it in numerical form.
- Using fraction circles and Student Resource Sheet 2 (1 per student), each student pair will work together to discover fractions equivalent to $\frac{1}{3}$. Draw a picture of each equivalent fraction that equals one third. Write the name of the fraction and write it in numerical form.
- Using fraction circles and Student Resource Sheet 3 (1 per student), each student pair will experiment with fractions equivalent to $\frac{1}{4}$. Draw a picture of each equivalent fraction that equals one fourth. Write the name of the fraction and write it in numerical form. (This sheet is optional.)
- Working in pairs, students complete Student Resource Sheet 4.
- Discuss answers, explanations, and reasoning as a class.

Day Two:

- Instruct students to put some items (pencils, paper, pens, etc.) on their desks but be sure $\frac{1}{2}$ of them are blue.
- Share sets and discuss why each set represents $\frac{1}{2}$ blue.
- Using fraction circles and Student Resource Sheet 5, each student will color $\frac{1}{2}$ of the eight parts on the first circle.
- Hold up circles for others to see and explain how you know it is $\frac{1}{2}$.
- Using student examples or your own if no students have done it, show students a circle where every other piece is shaded. Discuss why that represents $\frac{1}{2}$. Work as a class to fill in the chart for $\frac{1}{2}$ of 8 parts. Then, instruct students to color $\frac{1}{2}$ of the second circle and fill in the chart.
- Have students complete Student Resource Sheet 6 for $\frac{1}{3}$ of 6 parts.
- Hold up circles for others to see and explain how you know it is $\frac{1}{3}$.
- Using student examples or your own, show students a circle where two non-touching sections are shaded. Discuss why that represents $\frac{1}{3}$. Work as a class to fill in the chart for $\frac{1}{3}$ of 6 parts. Then, instruct students to color $\frac{1}{3}$ of the second circle and fill in the chart.
- Using the fraction circles and Student Resource Sheet 7, discuss how many parts $\frac{1}{2}$ of six would be and color $\frac{1}{2}$ of the first circle red. Discuss how many parts $\frac{1}{3}$ of six would be and color $\frac{1}{3}$ of the same circle blue. Fill in the blanks under the circle. Instruct students to color the other circle on the page to represent $\frac{1}{2}$ of the six parts as one color and $\frac{1}{3}$ of the six parts as another color. Fill in the blanks under that circle.
- Working in pairs using the fraction circles and Student Resource Sheet 8, students color each 8-part circle to show $\frac{1}{2}$ of the eight parts as one color and $\frac{1}{4}$ of the eight parts as another color and fill in the blanks under each circle.

Day Three

- Using the colored cubes, the students will make the kite strings as the teacher reads the Kite Strings Activity Cards #1-4. See Teacher Resource Cards. (Make each Kite String with cubes prior to the activity to show the students after they have attempted each problem.) Before showing the students each solution, repeat the directions so they can check their work.
- Using the colored cubes and index cards, the students will make a kite string using 6-12 cubes. They will write rules for their kite string on an index card to be read to their partner. That partner attempts to create the kite string based on the rules that his/her partner has written. To check, the completed kite strings are compared to the original ones. (After the cards are used, each student can draw and color his/her kite string on the back to be used in a self-checking center.)
- Using the colored cubes and Student Resource Sheet 9, students make and/or color the 16 part kite string to match the rules given.

Day Four

- Give students colored cubes.
- Review the kite strings activity by using 3-4 of the kite string rules from the index cards that the students wrote.
- Complete Performance Assessment Sheets 1-3.

Performance Assessment:

The students will be completing Performance Assessment Sheets 1-3. They will be combining unlike fractional parts to complete a whole and explain their thinking.

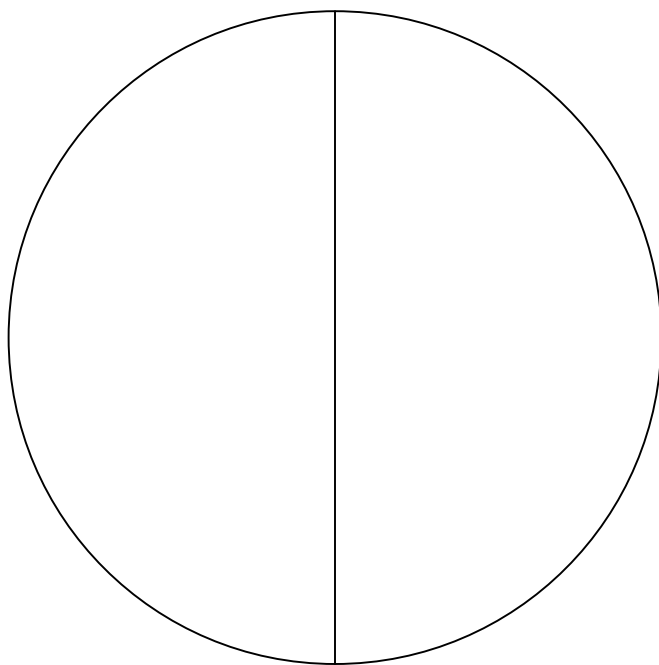
Extension/Follow Up:

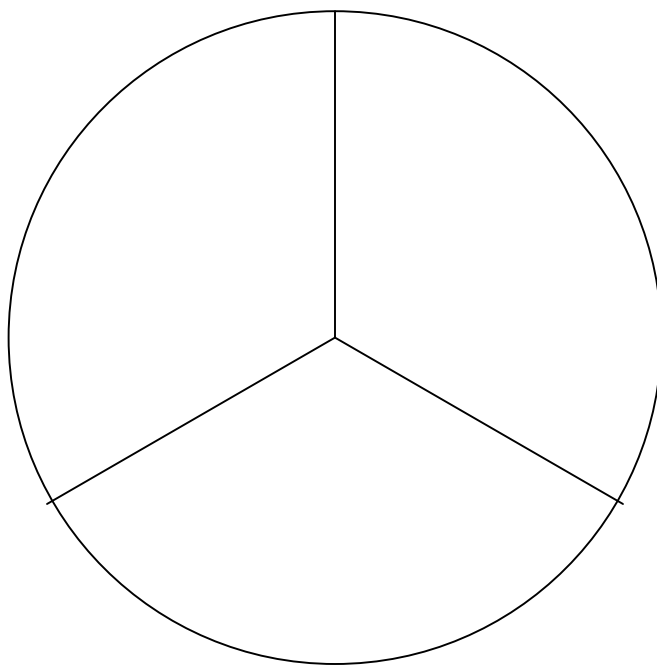
Student-made Kite Strings can be used at a center.

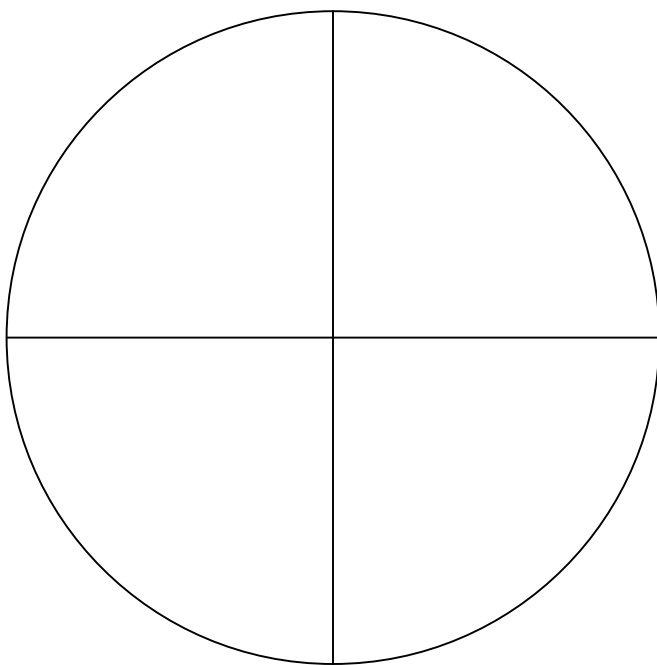
Authors:

Aileen Welsh
Castle Hills Elementary
New Castle, DE

Stephanie Williams
Bay View Elementary
North East, MD

$1/2$ [illegible]

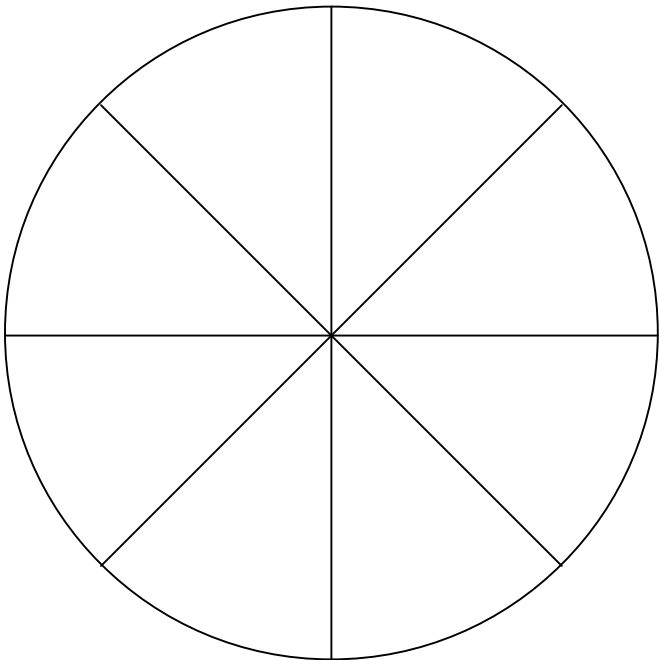
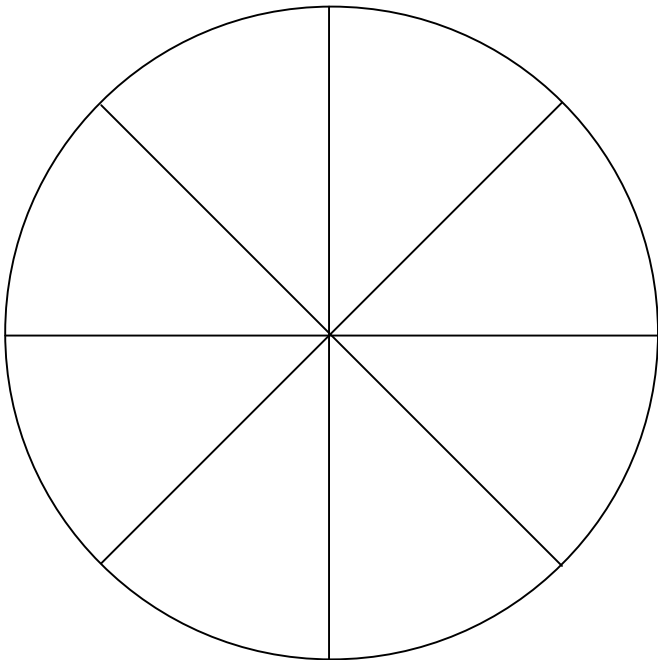
$1/3$ [illegible]

$1/4$ [illegible]

1. In the kite contest Aileen noticed that five out of ten kites had blue stripes. She said, “one-half of the kites have blue stripes.” Is she correct? Why or why not? Use pictures, numbers and/or words to explain your thinking.

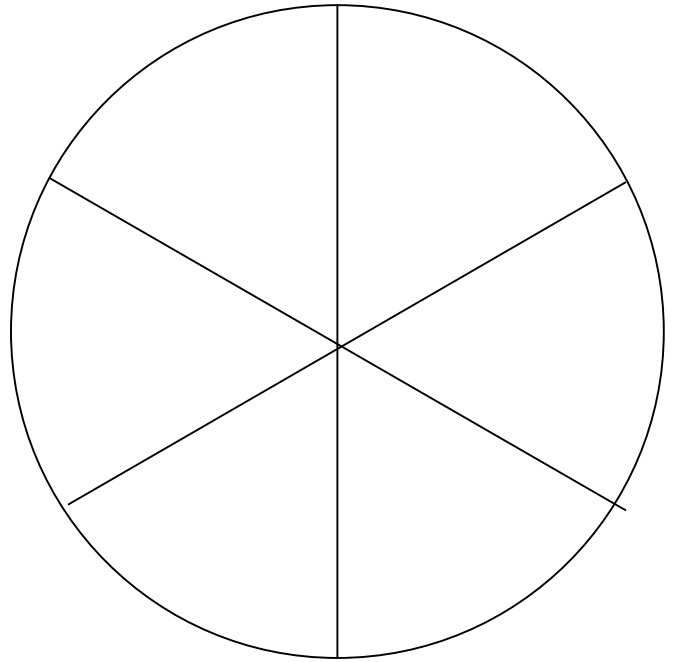
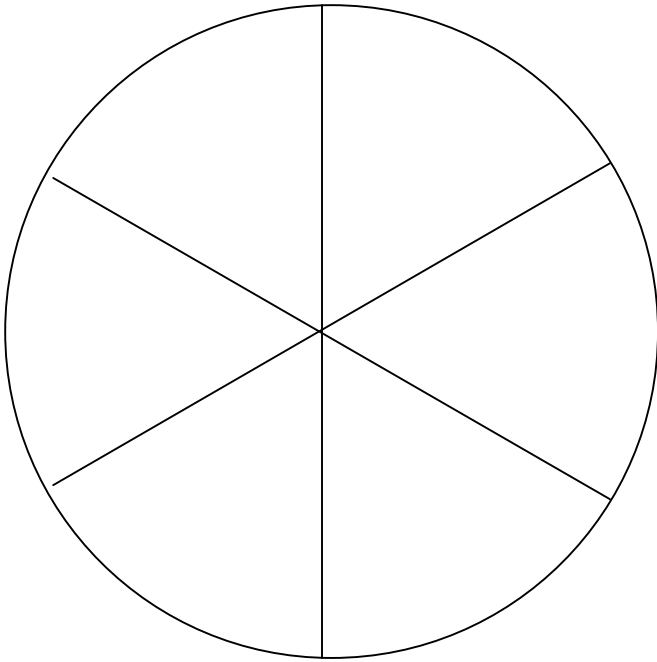
- 2. Stephanie noticed that four out of six kites had rainbows on them. She said, “one-third of the kites have rainbows on them.” Is she correct? Why or why not? Use pictures, numbers and/or words to explain your thinking.**

Equivalent Fractions of 1/2



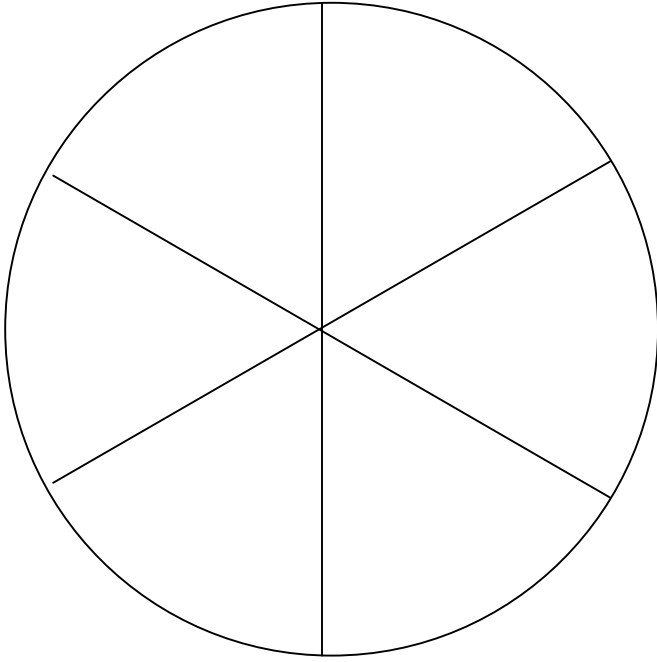
| <i>Picture</i> | <i>Shaded Parts</i> | <i>Total Parts</i> | <i>Fraction</i> | <i>Equivalent Fraction</i> |
|-----------------------|----------------------------|---------------------------|------------------------|-----------------------------------|
| | | | | |
| | | | | |

Equivalent Fractions of 1/3



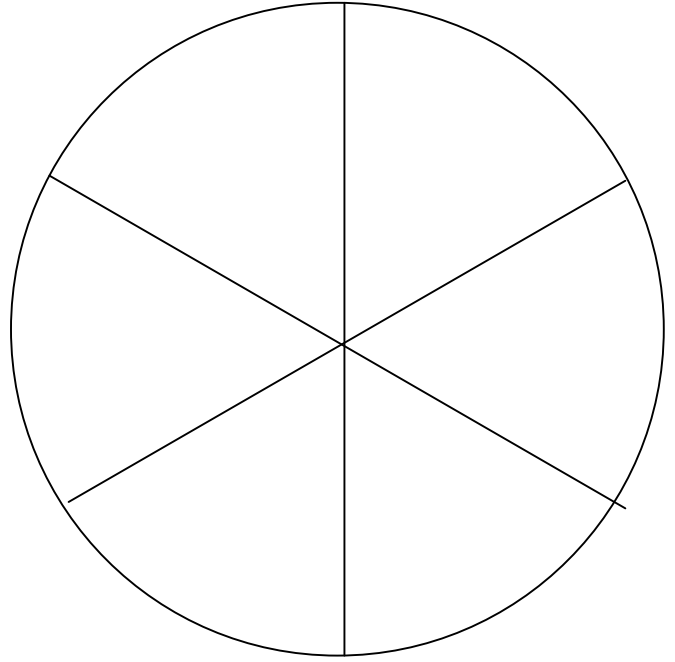
| <i>Picture</i> | <i>Shaded Parts</i> | <i>Total Parts</i> | <i>Fraction</i> | <i>Equivalent Fraction</i> |
|----------------|---------------------|--------------------|-----------------|----------------------------|
| | | | | |
| | | | | |

Fraction Combinations Using $\frac{1}{2}$ and $\frac{1}{3}$



$\frac{1}{2}$ of 6 parts is _____

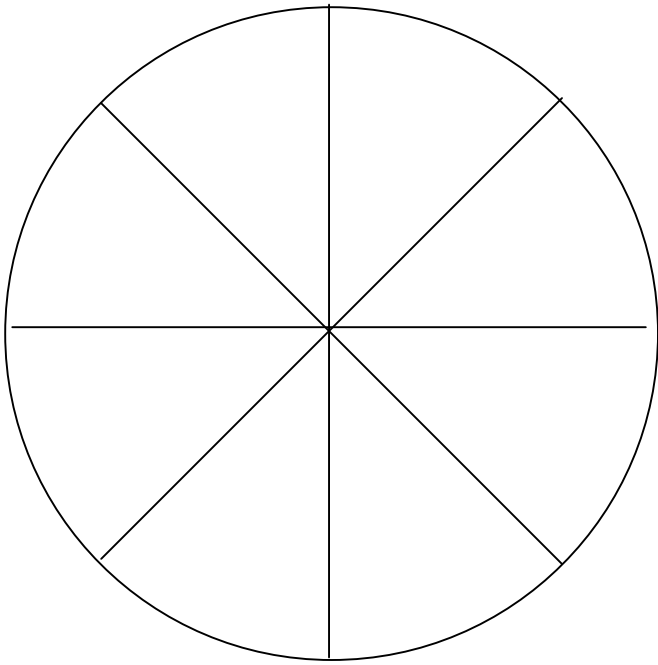
$\frac{1}{3}$ of 6 parts is _____



$\frac{1}{2}$ of 6 parts is _____

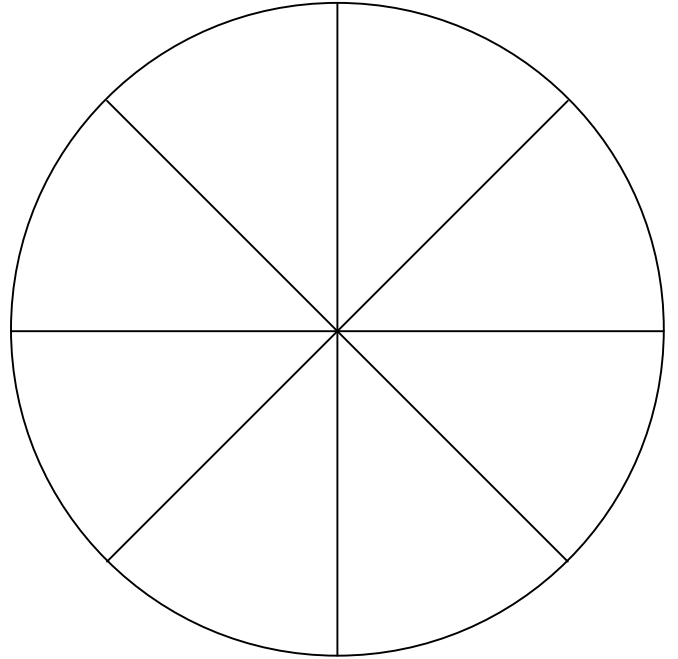
$\frac{1}{3}$ of 6 parts is _____

Fraction Combinations Using $\frac{1}{2}$ and $\frac{1}{4}$



$\frac{1}{2}$ of 8 parts is _____

$\frac{1}{4}$ of 8 parts is _____



$\frac{1}{2}$ of 8 parts is _____

$\frac{1}{4}$ of 8 parts is _____

- ◇ Use exactly 16 cubes.
- ◇ Use 4 different colors.
- ◇ Make $\frac{1}{2}$ of the kite string red.
- ◇ Make $\frac{1}{8}$ of the kite string white.
- ◇ Make $\frac{1}{4}$ of the kite string blue.
- ◇ Make $\frac{1}{8}$ of the kite string green.

[illegible]

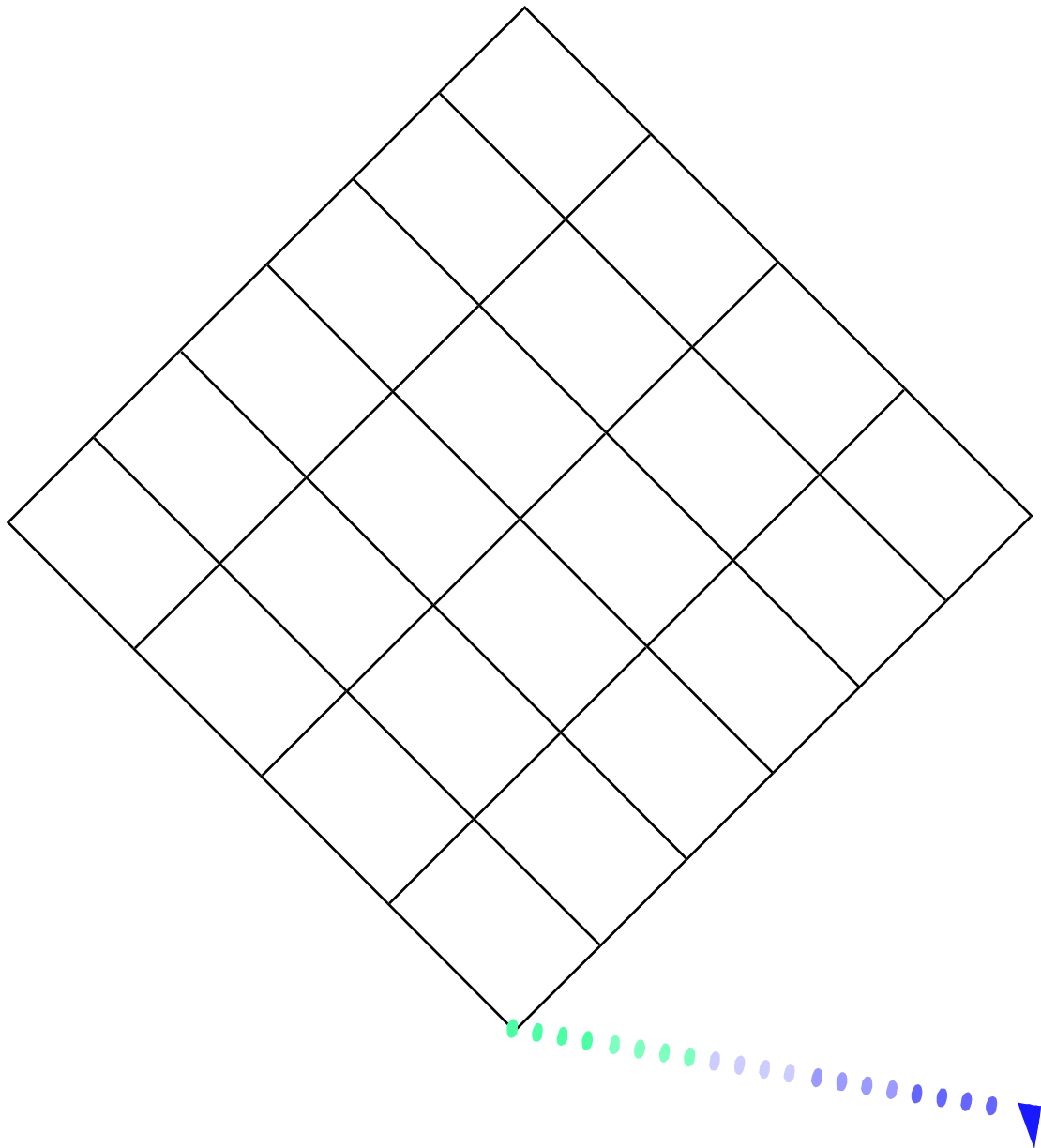


Your class will be entering a kite decorating competition. The judges would like you to design an original kite on the following page. You must follow the rules below or you will be disqualified.

- ◇ Rule 1: You must color all 24 spaces on the kite.
- ◇ Rule 2: You must make exactly $\frac{1}{2}$ of the 24 spaces on the kite a solid color.
- ◇ Rule 3: You must make a design in exactly $\frac{1}{3}$ of the 24 spaces on the kite.
- ◇ Rule 4: You must put your first initial in $\frac{1}{12}$ of the 24 spaces on the kite.
- ◇ Rule 5: You may color the rest of the kite however you like but be sure it is different from the other parts.

You may use cubes to help design your kite. When you are finished with your design answer the questions on the rest of the pages.

Kite Decorating Competition

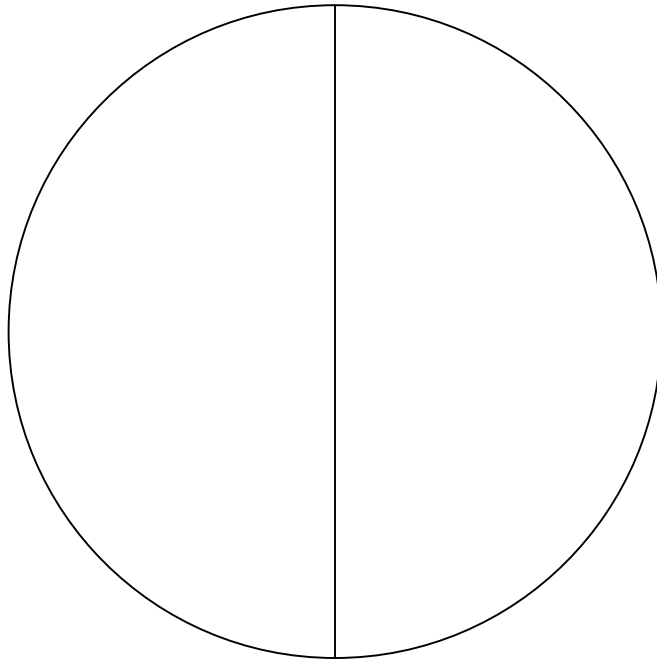




Use the judges' information and your kite to write complete explanations for numbers 1 and 2.

1. The judges said to make a design in $\frac{1}{3}$ of the spaces on the kite. Explain how you knew how many spaces needed designs in them.

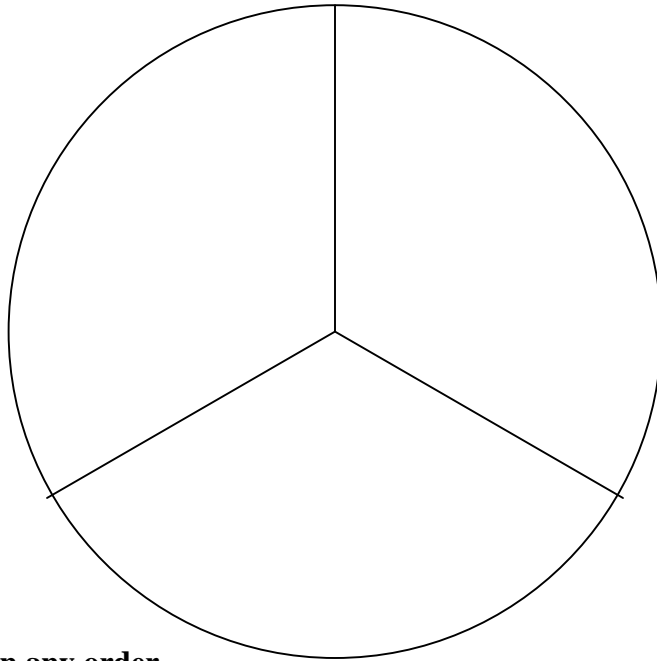
2. Write a short note to the judges explaining why you colored your kite the way you did. Be sure to prove to them that you followed all of the rules.

$\frac{1}{2}$ 

These can be in any order.

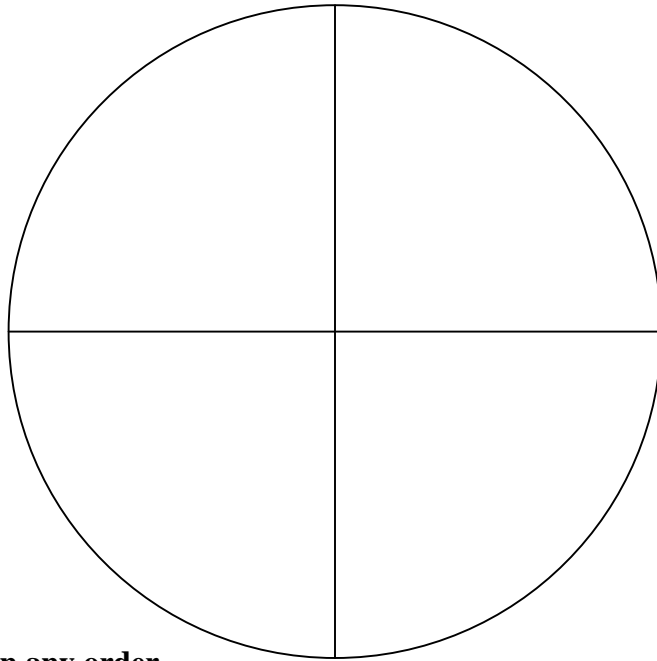
| <i>Picture</i> | <i>Shaded Parts</i> | <i>Total Parts</i> | <i>Name</i> | <i>Fraction</i> |
|----------------|---------------------|--------------------|----------------------------|--------------------------------|
| | 1 | 2 | One-half or half | $\frac{1}{2}$ |
| | 2 | 4 | Two-fourths or one-half | $\frac{2}{4}$ or $\frac{1}{2}$ |
| | 3 | 6 | Three-sixths | $\frac{3}{6}$ |
| | 4 | 8 | Four-eighths | $\frac{4}{8}$ |
| | 5 | 10 | Five-tenths | $\frac{5}{10}$ |
| | 6 | 12 | Six-twelfths | $\frac{6}{12}$ |

$\frac{1}{3}$



These can be in any order.

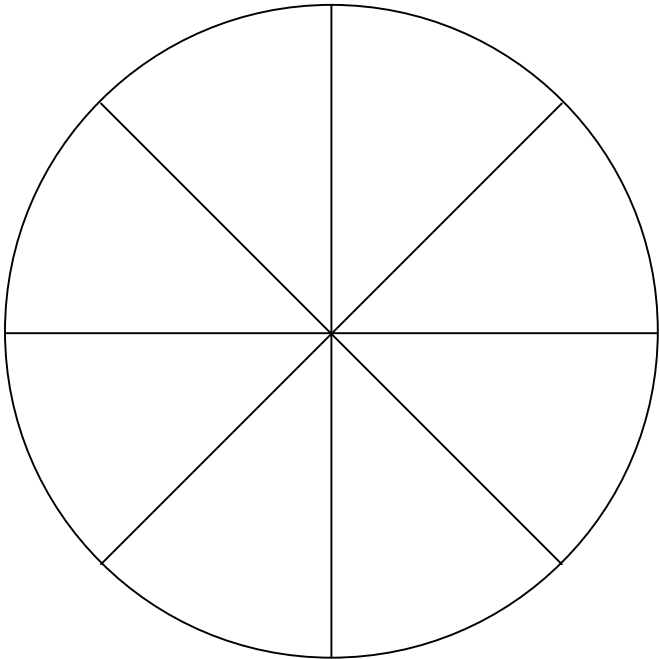
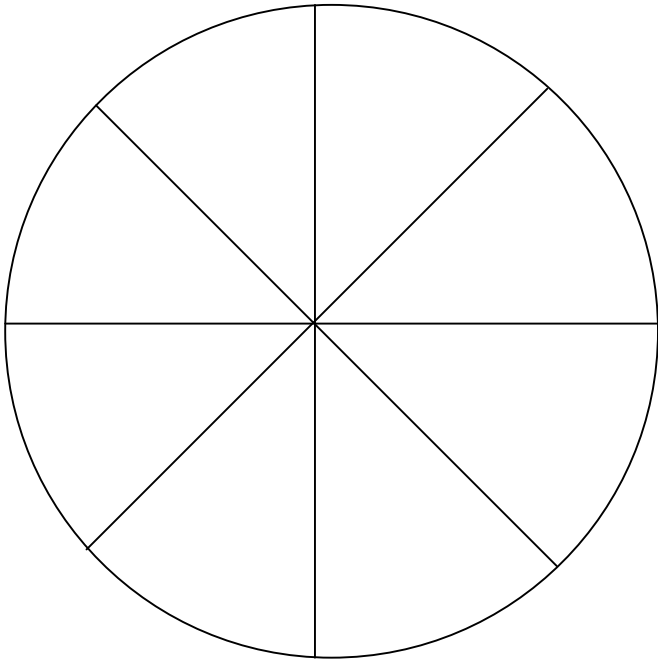
| <i>Picture</i> | <i>Shaded Parts</i> | <i>Total Parts</i> | <i>Name</i> | <i>Fraction</i> |
|----------------|---------------------|--------------------|---------------|-----------------|
| | 1 | 3 | One-third | $\frac{1}{3}$ |
| | 2 | 6 | Two-sixths | $\frac{2}{6}$ |
| | 4 | 12 | Four-twelfths | $\frac{4}{12}$ |
| | | | | |
| | | | | |

$\frac{1}{4}$



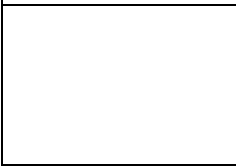
These can be in any order.

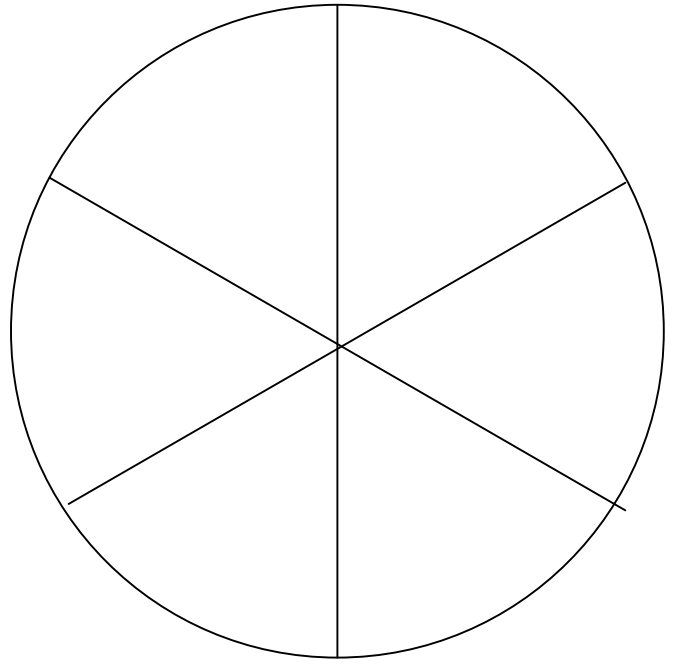
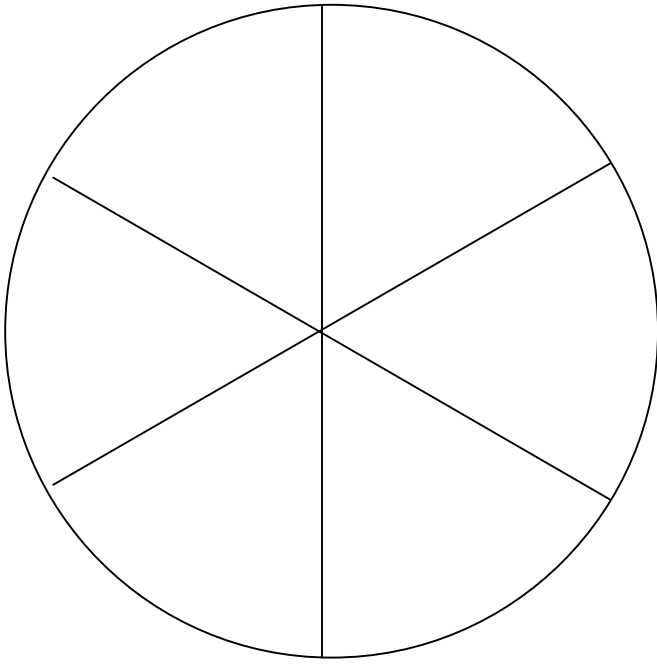
| <i>Picture</i> | <i>Shaded Parts</i> | <i>Total Parts</i> | <i>Name</i> | <i>Fraction</i> |
|----------------|---------------------|--------------------|----------------|-----------------|
| | 1 | 4 | One-fourth | $\frac{1}{4}$ |
| | 2 | 8 | Two-eighths | $\frac{2}{8}$ |
| | 3 | 12 | Three-twelfths | $\frac{3}{12}$ |
| | | | | |
| | | | | |



Equivalent Fractions of 1/2



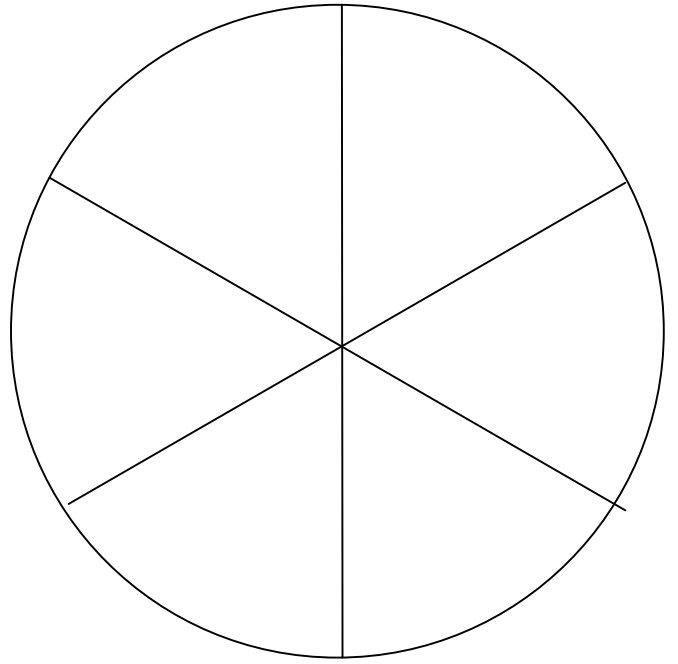
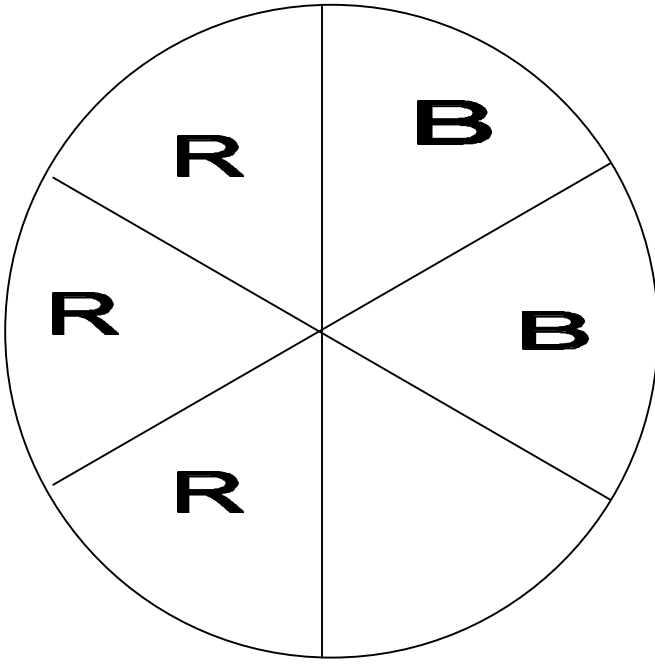
Pictures will vary.

| <i>Picture</i> | <i>Shaded Parts</i> | <i>Total Parts</i> | <i>Fraction</i> | <i>Equivalent Fraction</i> |
|---|---------------------|--------------------|-----------------|----------------------------|
|  | 4 | 8 | $\frac{4}{8}$ | $\frac{1}{2}$ |
|  | 4 | 8 | $\frac{4}{8}$ | $\frac{1}{2}$ |

Equivalent Fractions of $\frac{1}{3}$ **Pictures will vary.**

| <i>Picture</i> | <i>Shaded Parts</i> | <i>Total Parts</i> | <i>Fraction</i> | <i>Equivalent Fraction</i> |
|---|---------------------|--------------------|-----------------|----------------------------|
|  | 2 | 6 | $\frac{2}{6}$ | $\frac{1}{3}$ |
|  | 2 | 6 | $\frac{2}{6}$ | $\frac{1}{3}$ |

Fraction Combinations Using $\frac{1}{2}$ and $\frac{1}{3}$



Color combination of this circle will vary.

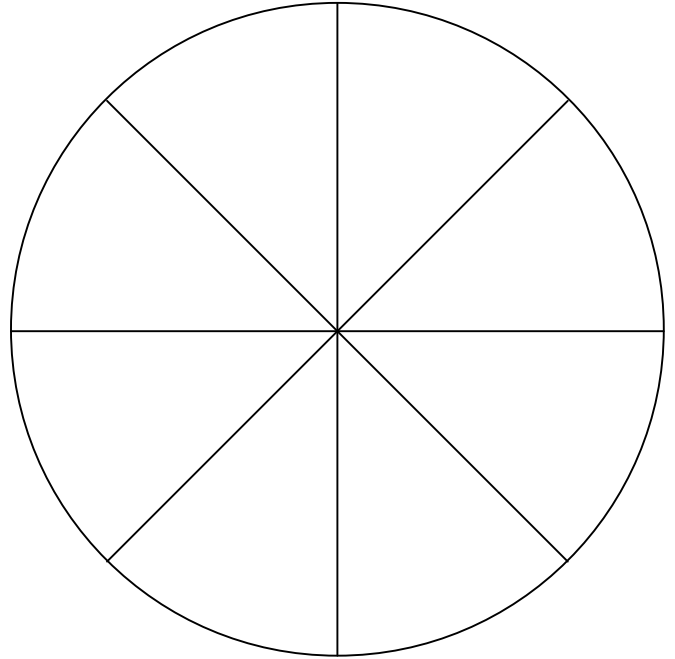
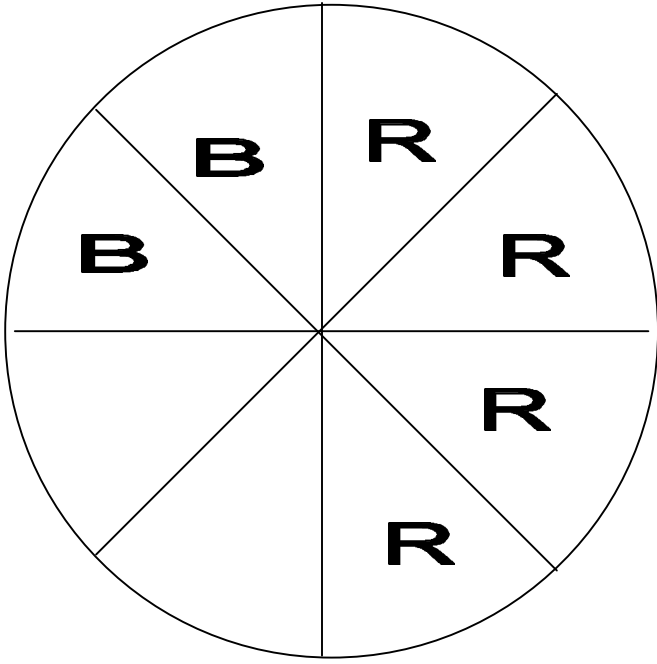
$\frac{1}{2}$ of 6 parts is 3

$\frac{1}{3}$ of 6 parts is 2

$\frac{1}{2}$ of 6 parts is 3

$\frac{1}{3}$ of 6 parts is 2

Fraction Combinations Using $\frac{1}{2}$ and $\frac{1}{4}$



Color combination of this circle will vary.

$\frac{1}{2}$ of 8 parts is 4

$\frac{1}{4}$ of 8 parts is 2

$\frac{1}{2}$ of 8 parts is 4

$\frac{1}{4}$ of 8 parts is 2



Follow the rules below to make my kite string.

- ◇ I used 6 cubes in all.
- ◇ I used 3 different colors.
- ◇ $\frac{1}{2}$ of the kite string is yellow.
- ◇ $\frac{1}{3}$ of the kite string is red.
- ◇ $\frac{1}{6}$ of the kite string is blue.



Follow the rules below to make my kite string.

- ◇ I used 10 cubes in all.
- ◇ I used 4 different colors.
- ◇ $\frac{1}{10}$ of the kite string is white.
- ◇ $\frac{1}{2}$ of the kite string is blue.
- ◇ $\frac{1}{5}$ of the kite string is red.
- ◇ $\frac{1}{5}$ of the kite string is orange.



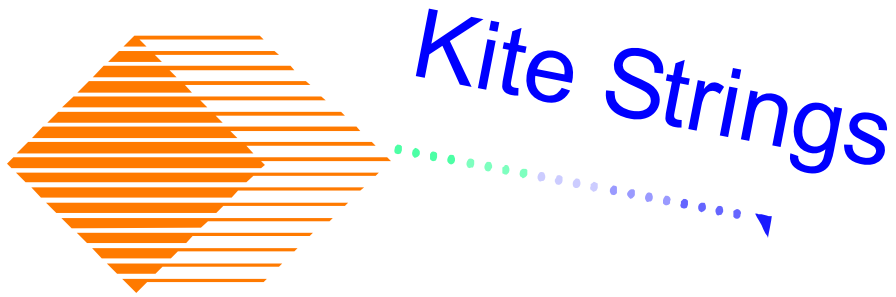
Follow the rules below to make my kite string.

- ◇ I used 12 cubes in all.
- ◇ I used 3 different colors.
- ◇ $\frac{1}{3}$ of the kite string is black.
- ◇ $\frac{1}{4}$ of the kite string is blue.
- ◇ $\frac{5}{12}$ of the kite string is green.



Follow the rules below to make my kite string.

- ◇ I used 12 cubes in all.
- ◇ I used 4 different colors.
- ◇ $\frac{7}{12}$ of the kite string is brown.
- ◇ $\frac{1}{12}$ of the kite string is yellow.
- ◇ $\frac{1}{6}$ of the kite string is white.
- ◇ $\frac{1}{6}$ of the kite string is red.



Follow the rules below and use your colored cubes to make the kite string.

- ◇ Use exactly 16 cubes.
- ◇ Use 4 different colors.
- ◇ Make $\frac{1}{2}$ of the kite string red.
- ◇ Make $\frac{1}{8}$ of the kite string white.
- ◇ Make $\frac{1}{4}$ of the kite string blue.
- ◇ Make $\frac{1}{8}$ of the kite string green.

Color the spaces below to match the kite string you made.

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R | R | W | W | R | B | B | B | R | R | R | R | B | G | G | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

Coloring may vary but
must be:

8 red
2 white
4 blue
2 green

Scoring Rubric for Performance
Assessment



Kite from sheet 2

- ◇ 3-Student colors kite correctly with 12 spaces a solid color, 8 spaces a design, 2 spaces with their first initial, and 2 spaces done differently.
- ◇ 2-Student follows 2-3 of the rules correctly.
- ◇ 1-Student follows only 1 of the rules correctly.
- ◇ 0-Student does not follow any of the rules correctly, it is blank, or it is too sloppy to check.

1. The judges said to make a design in $\frac{1}{3}$ of the spaces on the kite. Explain how you knew how many spaces needed designs in them.

- ◇ 2-Student responds 8 and explains their reasoning clearly.
- ◇ 1-Student responds 8 but the explanation is unclear or missing.
- ◇ 0-Student responds incorrectly or it is blank or illegible.

2. Write a short note to the judges explaining why you colored your kite the way you did. Be sure to prove to them that you followed all of the rules.

- ◇ 4-Student correctly states the number of spaces colored for each of the four fractional parts and clearly explains their strategy.
- ◇ 3-Student correctly states the number of spaces colored for at least two of the four fractional parts and clearly explains their strategy.
- ◇ 2-Student correctly states the number of spaces colored for at least two of the four fractional parts but the explanation is unclear.
- ◇ 1-Student correctly states the number of spaces colored for only one of the four fractional parts. Explanation may be unclear or missing.
- ◇ 0-Blank or student does not identify any of the four fractional parts correctly and the explanation is unclear or missing.